2015 Top Markets Report
Cloud Computing

A Market Assessment Tool for U.S. Exporters

July 2015

Industry & Analysis' (I&A) staff of industry, trade and economic analysts devise and implement international trade, investment, and export promotion strategies that strengthen the global competitiveness of U.S. industries. These initiatives unlock export, and investment opportunities for U.S. businesses by combining in-depth quantitative and qualitative analysis with ITA's industry relationships.

For more information, visit
www.trade.gov/industry

I&A is part of the International Trade Administration, whose mission is to create prosperity by strengthening the competitiveness of U.S. industry, promoting trade and investment, and ensuring fair trade and compliance with trade laws and agreements.

INTERNATIONAL
T R A D E
ADMINISTRATION

Table of Contents

This Page Intentionally Left Blank

Executive Summary and Key Findings

Long predicted to fundamentally shift the way workloads are managed, cloud computing has emerged as a game-changing information and communications technology (ICT) phenomenon with a wide array of benefits for businesses and consumers. Although to date worldwide cloud adoption has been impressive, even quicker uptake may be in store in the next several years. As in other ICT subsectors, U.S. cloud providers have earned leading global positions. One major report polled over 350 companies from around the world, finding that 17 of the top 20 enterprise cloud services came from companies based in the United States.[1] Further, on technology industry research firm Gartner's May 2014 "Magic Quadrant for Infrastructure as a Service" grid, a widely-followed tool dividing vendors based on their status as market leaders, niche players, or other roles, all but two of the 15 providers plotted were U.S. companies.[2]

Despite many leading U.S. cloud vendors' international presence, constructing an export profile for this sector is a difficult task. Several of the key firms are large and publicly traded, but other market leaders share less information about their internal structures. There is also an ecosystem of smaller cloud providers that may export but are not widely reported on. In other cases, details about international sales are scarce, making it hard to determine whether a given firm, even one understood to be a top vendor, has a notable footprint globally, let alone in specific regions.

In addition, at least on a basic technical level and in the absence of market access issues or infrastructure gaps, cloud services can be provided from anywhere to anywhere. This lowers U.S. cloud vendors' initial hurdles to exporting, so providers of varying sizes, focuses (e.g., customer relationship management, enterprise resource planning, collaboration, storage, or, frequently, some mix), years in operation, and other dimensions may engage in international sales. This further complicates the task of creating a coherent picture of cloud service exporters.

What is apparent is that many well-known U.S. vendors have expanded abroad aggressively, either through marketing or less commonly by establishing physical presences like sales offices or data centers. In many of the markets to which they have gone, these companies have established leading positions or at least become important competitors (often with one another).

Leadership today, however, guarantees neither that U.S. cloud vendors will succeed in every global market they enter nor that they will remain on top. Some foreign-based companies (e.g., Germany's SAP) are highly-credible competitors, while others have solid or growing stakes in their home countries (e.g., Alibaba's Aliyun in China). Moreover, in some large markets there has been discussion or enactment of regulatory measures that have the effect of disadvantaging foreign firms.

Regardless, as in ICT more broadly, the U.S. cloud industry enjoys high levels of expertise, scale, technology, resources, innovation, name recognition, and first-mover advantages. All will be helpful in maintaining the U.S. lead as cloud computing continues to take off around the world – and there is every indication that growth will continue to be this subsector's story for some time.

As in previous years, forecasts for global cloud adoption are bullish. For example, Forrester believes that businesses will spend about $191 billion on cloud services by 2020, compared to $72 billion in 2014.[3] This projection suggests a future cloud market 20 percent larger than had been indicated in prior forecasts from the firm, which says the sector has entered a "hypergrowth" stage and is displacing on-premise setups faster than expected. IDC predicts a 2017 market worth $107 billion, over twice as much as its 2013 estimate of $47.4 billion.[4]

Figure 1: Projected Top Markets for Cloud Computing Exports (through 2015)

1. Japan	6. Brazil	11. Switzerland	16. Italy
2. United Kingdom	7. Australia	12. South Korea	17. Spain
3. Canada	8. India	13. China	18. Singapore
4. Netherlands	9. Ireland	14. Mexico	19. Belgium/Luxembourg
5. Germany	10. France	15. Sweden	20. South Africa

For its part, Gartner has listed cloud computing as a top technology trend for the past six years, and expects that in 2015 Microsoft's cloud profits will exceed those from its on-premise offerings for the first time, an important and symbolic transition given the company's past focus and more recent pivot to cloud services.[5, 6] Such uniformly ambitious estimates (and the differing research methodologies to go with them) abound.

Among the key trends shaping the cloud ecosystem over the next several years is the continued prominence and even quicker rise of software-as-a-service (SaaS, in which users access virtual applications, such as office productivity software, hosted on remote servers), the cloud segment widely expected to show the strongest growth in both revenues and deployments. One prediction is that by 2016, worldwide SaaS revenues will total approximately $106 billion.[7] Other forecasts call for over $78 billion in 2015 SaaS sales and more than $132 billion by 2020, or $50.8 billion in 2018 revenues from SaaS-based business applications alone.[8, 9] While dollar figures differ, usage projections are equally compelling.

Cisco's comprehensive Global Cloud Index study found that in 2013, SaaS workloads were already nearly as common as infrastructure-as-a-service-based ones (IaaS, the most basic model, providing virtual computing infrastructure like storage and networking functions) (41 percent of the total versus 44 percent). The study posits, however, that at 59 percent come 2018, SaaS workloads will far outpace those attributable to either IaaS (28 percent) or platform-as-a-service (PaaS, a developer-focused cloud model offering platforms and tools for application creation) (13 percent).[10] The report authors point to growing trust in SaaS as this service delivery model becomes more mature and commonplace, as well as the increasing utility of applications offered through it, as key drivers for this leap.

Wider adoption of public cloud services, at least in the long term, is another important trend. Although security concerns continue pushing many towards hybrid cloud deployments (in which an organization utilizes both public and private cloud systems for different business processes), public cloud expenditure will still grow six times as quickly as overall IT spending over the 2013-18 time horizon, more than doubling in value to $127 billion by the end of this period.[11] Other estimates are even more

optimistic, calling for $250 billion in public cloud spending by 2017, from $158 billion in 2014.[12] Possible explanations for this trend include the growing understanding that cloud vendors offer state-of-the-art security; the innovative security-related services actually being marketed by those vendors; a gathering boom in value-added offerings available through public clouds; the popularity of "cloud first" approaches in procurement ecosystems; and greater overall trust in public clouds.[13, 14, 15]

This does not preclude the continued popularity of hybrid approaches, which incorporate some public cloud services and could be in use in 50 percent of businesses by 2017, especially given that security remains a paramount worry and the response is often to hold some data in-house.[16] Nor does it mean that private clouds will become irrelevant in the next few years, with at least two credible surveys pointing to their continued importance (although in one case also predicting a slight decline in usage and corresponding rise in public cloud utilization).[17, 18]

However, with time, maturity, and familiarity, public cloud services are likely to become an even more important factor than they are today.[19] Indeed, by 2018 public cloud is expected to constitute "more than half of worldwide software, server, and storage spending growth," according to IDC.[20] One prominent example of this trend is General Electric, a U.S.-based but global company that in 2014 rolled out over 90 percent of its applications in a public cloud environment.[21] In addition, greater public cloud adoption may spur wider SaaS usage, since SaaS constituted 70 percent of public cloud spending in 2014.[22]

Much of the expected rise in international cloud usage will come from markets like those mentioned in this report. Particularly in developed countries, foreign ICT decision-makers, though responsive to their own unique contexts, often share many of the same cloud-related motivations and concerns as their U.S. counterparts. One recent survey received comparable responses from a group comprised of Australian, Brazilian, German, Singaporean, and British managers to those from their North American counterparts.

There were clear similarities in their objectives in utilizing cloud services, the concerns preventing them from rolling out cloud-based business applications, and misgivings about their "current digital supply chain."[23] The extent of overlap in such factors, both

positive and negative, should be a boon to U.S. cloud providers hoping to focus their energies on addressing a core set of globally-relevant issues.

Across developed and developing markets alike, there has also been a clear trend of firms in more traditional industries tapping into ICT solutions to increase productivity, enhance efficiency, or otherwise improve business processes (e.g., human resources, customer relations management, and logistics). This accords with the findings of the McKinsey Global Institute, which determined through an international survey of small- and medium-sized enterprises that three-quarters of the economic benefits generated by the Internet accrue not to purely ICT companies but to those in traditional sectors (e.g., manufacturing), often through productivity gains.[24] As economies around the world grow and local businesses of all types recognize the value of implementing ICT solutions, cloud vendors can expect to see greater interest not just from technology groups, but from manufacturers, retailers, and other more conventional sources.

At the same time, the international landscape also presents a variety of unique challenges for U.S. companies. For example, many foreign buyers have expressed concerns about who has access to their data and privacy in general. Following the surveillance disclosures, trust-related issues like these increasingly give pause to those considering the purchase of cloud services from U.S. vendors, especially those who do not store data locally.

Additionally, many governments around the world continue to contemplate or institute measures that make it harder for U.S. cloud providers to compete locally.

These include data localization rules (i.e., requirements to store user data in domestic servers), which create significant costs and technical inefficiencies. As cybersecurity depends most directly upon the technologies and processes used to secure information and not the physical location of data servers, these policies can fail to provide the sort of

security purportedly sought. The underlying motivations for such proposals may involve a mix of cybersecurity-related concerns, protectionist impulses, or in some cases a desire within foreign governments to show receptivity to local security concerns and mount some sort of response, however flawed. Even when not protectionist in their intent, these policies can notably hinder non-domestic cloud vendors.

This report describes specific barriers as well as other issues affecting the attractiveness of various global markets for U.S. cloud computing providers. It also attempts a ranking of the top twenty markets for cloud computing, with a focus on enterprise adoption. This is based on export data from the U.S. Bureau of Economic Analysis (BEA) and a wide variety of reports and statistics on topics such as policy and regulatory environments, Internet infrastructure, business adoption, and several other items (see the methodology annex for further details). This, in turn, has been weighed by U.S. Department of Commerce trade specialists in light of their existing knowledge and expertise, extensive research into the markets profiled, and in some cases feedback from in-country staff.

The results are a subjective but well-reasoned ranking and several country reports that should be instructive. The chief caveat is that authoritative data on cloud computing exports is presently unavailable. Although BEA maintains reliable statistics and the figures examined correspond to categories most likely to include cloud exports, a wider body of data on which to base numerical comparisons or explain anomalies is lacking. Nor is there a universally-recognized methodology or set of indicators that will lead to an indisputable ranking. In addition, there is substantially more relevant, non-numerical information available about some markets than others. Despite these challenges, this *Top Markets Report* is a thoroughly-researched document that makes sense of a limited body of information and provides meaningful insights for policymakers, market participants, and others.

This Page Intentionally Left Blank

Country Case Studies

The following pages include country case studies that summarize export opportunities in selected markets. The overviews outline ITA's analysis of the U.S. export potential in each market. The markets represent a range of countries to illustrate a variety of points – and not the top five markets overall.

This Page Intentionally Left Blank

Japan

Japan is the top market for cloud services globally, ranked 1ˢᵗ in our analysis. The country boasts the most consistent and developed market for cloud services; additionally, there is substantial room for growth for U.S. cloud providers. Despite the existence of an established market with local competitors, domestic players do not seem to enjoy trade barrier-related advantages over foreign vendors. Further, Japan's commitment to universal broadband access for all households by the end of 2015 presents a uniquely connected market with near-total participation in ICT service needs. There should be caution and attention paid to potential privacy and data protection laws in the country as well as a decrease in consumer spending in 2014; however, Japan is still the top market for cloud services in 2015.

Overall Rank

1

Japan has consistently been one of the top markets for growth in information and communications technology (ICT) and cloud services. Gartner predicts that by 2018 the Asia Pacific and Japan (APJ) region will account for $11.5 billion in total cloud services spending. As the leading cloud market in the APJ region, Japan is poised for continued growth through 2018.[1] The Asia Cloud Computing Association selected Japan as the top cloud market for the third consecutive year in their Cloud Readiness Index.[2] Japan ranks among the top Asian markets for almost all categories used in the rankings, including broadband quality and intellectual property protections.[3]

Analysts project that from 2013 to 2018, the cloud computing market will grow at a 9.7 percent annual rate.[4] Driving this estimate is the increasing adoption of cloud services by Japanese small- and medium-sized enterprises.[5] Expansion in Japan's cloud services market is the product of direct private and public investment in ICT infrastructure and a commitment to cloud services by the government. To date, Japan has developed a regulatory environment that preserves free flow of data while protecting privacy. The country has existing comprehensive intellectual property (IP) and cybercrime laws, protecting IP stored on clouds from theft and offering recourse in case of breaches.[6] Japan also joined the APEC Cross-Border Privacy Rules system in 2014. This system of voluntary but enforceable rules governing international transfers of data provides both strong privacy protections and greater flexibility to data controllers than more prescriptive regulatory approaches might. Further, the potential completion of the Trans-Pacific Partnership (TPP) in 2015 could further lower trade barriers in Japan and throughout the region.

Government regulations are just one of the means by which authorities have stimulated cloud services growth. Since 2009, Japan's government has strengthened cloud infrastructure through the "Digital Japan Creation Project" with annual rollouts of new government-led cloud services through 2015.[7] This project, the "Kasumigaseki Cloud," supports all government ICT systems and has been key in growing Japan's cloud market. This cloud has enabled public and private sector collaboration on processing of government documents and included increased online applications to encourage public use of mobile devices in accessing government functions.[8] Moreover, Japan's government has committed to ensuring all households have "very high speed" fiber broadband connections by the end of 2015, bringing the potential benefits of cloud services to every household in the country.[9] While the "Kasumigaseki Cloud" program and nationwide broadband initiative continue, Japan can be safely expected to look for new ways to use government investment to spur cloud adoption with the general public.

Corporate investors from the United States have been helpful in stimulating Japan's cloud-related infrastructure. For example, in August 2014, Google announced a partnership with five Asian ICT companies to construct a new fiber-optic cable system connecting the United States with two Japanese cities, Chikura and Shima.[10] Google's investment is meant to spur user growth for the Google Cloud Platform. The project is expected to be completed by the second quarter of 2016.

Five of the six "key vendors" of cloud services identified by industry watchers are U.S. companies –

Amazon Web Services, Google, IBM, Microsoft, and Salesforce.[11] American companies have had strong historic success in the Japanese ICT market, particularly with recent cloud investments. There are currently no significant trade barriers that favor domestic cloud providers over foreign ones, making Japan a strong market for foreign involvement. In addition, by 2016 Japanese regulators will require the electronic submission of data from any scientific or health care clinical trials, a key market for U.S. cloud providers like Medidata and one offering opportunities for other vendors as well.[12]

However, it should be noted that competition in Japan's cloud computing market is intense. In addition to growing participation by Chinese ICT companies, Japan has strong domestic cloud firms, such as Fujitsu. In January 2015, this local ICT leader announced expansion plans for its existing data centers to meet increased demand related to Internet of Things services.[13] The announcement comes after a summer 2014 plan for Fujitsu to invest $2 billion between 2014 and 2017 to capture an increased market share in cloud computing.[14]

Competition is not the only relevant factor in Japan for cloud providers. The government has proposed amendments to its privacy law that involve restrictions on the cross-border transfer of personal data. The legislation would limit the transfer of personal data outside of Japan with three exceptions: consent by the data subject, a finding of adequacy of the destination country's privacy laws, or compliance with unspecified procedures ensuring alignment with Japanese requirements. While data protection is vital, such an approach could restrict even those cloud providers with strong safeguards in place for personal information stored on their servers, based on their location in jurisdictions not deemed to be adequate. The law is expected to pass the Diet before the summer of 2015.

In addition to the likely changes in Japan's regulatory framework, there are economic concerns of which cloud vendors should remain mindful. In January 2015, Microsoft announced a drop in profits, citing earnings shortfalls in Japan and China as a leading cause.[15] Also, new projections show declining corporate revenues in Japan due to faltering economic conditions attributable to decreased consumer spending. In turn, the spending decline in Japan is due to an increased local sales tax. This chain of events has, in the Microsoft example, already impacted earnings, and could potentially limit the market for U.S. cloud providers in 2015.[16]

Nevertheless, Japan offers substantial opportunities for cloud providers in 2015 and beyond. In spite of the proposed data privacy legislation and the economic climate representing potential barriers, the market is expected to remain the top country for U.S. cloud services.

United Kingdom

Ranking 2nd overall, the United Kingdom is an important market for U.S. cloud vendors, who benefit from its developed economy, established base of business customers that understand the cloud value proposition, and the lack of infrastructural hurdles present in other countries. However, UK-based adopters harbor some deep security concerns and this has a clear impact on how cloud services are adopted and deployed.

Overall Rank

2

As an advanced economy with a mature IT market, the United Kingdom has been a notable destination for cloud-based services. While there are few estimates of the overall size of the UK-specific cloud sector, credible research indicates that its 2014 value may have been about $9.5 billion (at the year-end 2014 exchange rate).[1] Separate sources posit that small- and medium-sized enterprises (SMEs) contributed $3.2 billion in cloud-related spending last year.[2]

Much market intelligence about enterprise cloud adoption in the United Kingdom comes from industry surveys. Almost four-fifths of UK firms asked during one such survey said they use at least one cloud-based service, citing flexibility and cost savings as two significant motivators.[3]

The cloud trade association behind the poll expected annualized 2013-14 growth of 20 percent and noted that overall cloud adoption had jumped an impressive 61 percent since 2010.[4] Large companies, smaller firms (i.e., those with less than 200 employees), and public sector organizations showed uptake rates of around 80 percent, 75 percent, and 68 percent, respectively.

In terms of 2015 spending plans, 72 percent of UK IT decision-makers queried by data center operator Equinix said they expected a larger cloud budget than in 2014.[5] Much of these funds will likely go to software-as-a-service (SaaS) providers, as survey data suggests that 57 percent to 70 percent of respondents use or are considering implementing SaaS solutions.[6, 7]

Infrastructure-as-a-service (IaaS) has also generated substantial interest among IT decision-makers, particularly in SMEs, which have reportedly helped

drive the value of this cloud segment to at least £851 million.[8] A survey of larger UK establishments reported on in November 2013 indicated that IaaS adoption may be lower among this group, however.[9]

One very discrete but real factor that may accelerate cloud adoption in multiple countries in 2015 (but that seems to have been discussed more in the UK context) is the end of Microsoft's support for its Windows Server 2003 operating system. According to the Cloud Industry Forum (CIF), the cessation of official support for this popular server management tool will prompt at least some organizations to consider transitioning to cloud-based solutions, an alternative to on-site servers, even though Microsoft will continue to support newer versions of Windows Server.[10] This transition will contribute to the 90 percent enterprise cloud adoption CIF expects by the end of 2015.

As is clear from the above statistics, and by at least two major U.S. cloud vendors' recent commitments to local data centers, the United Kingdom is an important destination for cloud providers.[11, 12] Most major U.S. providers offer services in this competitive market and are well-represented in key UK industry groups.[13, 14] However, as is true elsewhere, concerns about data protection and security as well as regulatory compliance make UK clients wary of handing over control of their data. Five out of six business decision-makers asked said that these two issues in particular are at least partially slowing cloud uptake.[15] Additional polls have found the related data sovereignty and privacy worries to be paramount.[16]

Such results have extremely significant implications for cloud uptake. "Data location, security, and privacy risks" were the concerns most prominently cited by

UK-based respondents to a recent KPMG survey, with legal compliance and doubts about integration with existing technology infrastructure emerging as secondary challenges.[17] According to KPMG, the consequence is that seven out of 10 UK firms allocate no more than one-tenth of their technology budgets to cloud solutions. This figure, which stands in contrast to the more upbeat findings from others, offers a sober assessment of the impact of these misgivings on adoption.

In other instances, firms of all sizes have cited budgetary constraints (which have a greater impact on public sector and smaller organizations), investments in legacy IT, and, again, integration between those existing systems and new, cloud-based ones as stumbling blocks.[18]

Additional challenges holding back adoption in their own right include supplier reliability questions, fears (particularly among smaller companies) of vendor lock-in, and reluctance to depend on an Internet connection for access to company data.[19, 20, 21] There is also a general preference for this data to be physically stored in the United Kingdom or at least Europe, especially among public sector and smaller clients.[22] This confluence of factors has led many British business decision-makers – approximately 30 percent according to one survey – to assert that they will never shift their data to the cloud, even as a plurality still indicates plans to do so.[23]

Such fears are especially acute in highly-regulated sectors such as financial services and healthcare, two industries where UK cloud growth has been slower.[24] Sluggish cloud adoption in these sectors has been seen across Western Europe for similar reasons.[25] At least for British accounting firms, however, recent polls suggest that uptake may be slowly but surely expanding.[26]

Given these concerns, it is understandable that the hybrid approach, in which both public and private cloud services are utilized by the same company, is the preferred method of deployment for as much as 89 percent of UK IT decision-makers.[27] Across a wide range of cloud-based solutions, including e-mail, payroll, and sales management, CIF found that strong pluralities prefer on-premise options due to security, data protection, and various other considerations.[28] This preference seems especially strong for accounting-related applications, data storage and backup, and online commerce-related functions, among several others.

Although the hybrid approach is well-entrenched and unlikely to be supplanted anytime soon, nearly half of the respondents to CIF's annual survey indicated that they are open to eventually shifting wholly to reliance on off-site cloud services. Further, hybrid deployments may increase familiarity and comfort with cloud technologies, driving greater adoption in the future.

Germany

Germany represents the 5th ranked market for cloud services, but has limitations for U.S. cloud providers. Aside from the established Internet and economic infrastructure, consumer and business demand for cloud services help make Germany a top-5 market globally for cloud services. While Germany offers obvious upside potential, there are limitations to market access, particularly among small- and medium-size enterprises (SMEs), for U.S. providers. Large U.S. vendors who are heavily involved in Germany have considered responding with EU- or German-only data centers located within the country, but that may not be an option for all interested players.

Overall Rank

5

Research and Markets predicts a compound annual growth rate in Germany's cloud computing market of 32 percent between 2013 and 2018.[1] This places the German market among the global leaders in growth potential for cloud services. The projected expansion is further supported by a 2013 Experton Group study predicting an increase in cloud computing spending of nearly $17 billion between 2012 and 2017 – a rise from current levels of roughly $3 billion to nearly $20 billion in projected revenue.[2, 3] Cloud services are expected to grow from almost $2 billion to nearly $12 billion; cloud integration and consulting from $550 million to almost $3 billion; and cloud infrastructure technology from $1 billion to more than $5 billion by 2017.[4]

As a highly-developed economy, Germany's demand for cloud services is tied to advancing digitalization in all areas of personal life and business. Moreover, it is Germany's existing infrastructure and consumer base that is driving demand for cloud services. A 2014 study indicated that only 26 percent of German companies do not currently use or plan future use of cloud services in their operations.[5] This highlights the enormous market potential Germany's private sector offers for cloud adoption and an expanding need for diverse cloud services.

Germany's cloud computing market is attractive for domestic, regional, and international cloud service providers. The country's status as a mature market means that domestic and foreign cloud providers alike benefit from well-developed existing infrastructure.

Competition for IT budgets is particularly strong among cloud vendors marketing to the German

Mittelstand (a term used to describe German SMEs) who prefer domestic providers.

Some cloud industry watchers indicate that Germany is the lone Western European country where opening a local office is virtually a requirement due to consumer concerns about cross-border data transfers and security outside of German borders.[6] By 2013, 87 percent of cloud services providers in Germany had domestic data centers – an increase from 50 percent in 2010 – while most remaining data was stored elsewhere in the EU.[7]

The fact that industry and public pressures have led to an increase in localized data storage create challenges for cloud providers without the willingness or ability to house information within Germany, a particular concern for smaller vendors.

Consumer concerns over compliance by foreign vendors with EU and German laws and regulations are longstanding.[8] As early as 2011, there were calls for the creation a German or EU cloud (i.e., Schengen cloud).

According to research conducted by the U.S. Commercial Service, industry insiders have not seen a strong turn away from cloud services as a whole in Germany, but rather an aversion to providers who might export the data to the United States. Therefore, it appears that cloud demand and local German offerings will benefit as the competitiveness of U.S. providers declines, making it harder for U.S. players to regain ground. While large U.S. providers have considered establishing or opened data centers within Germany to process EU or German data, this is not a viable option for all U.S. service providers.[9]

This Page Intentionally Left Blank

Brazil

Brazil, which is ranked 6th, presents a large, sophisticated, and growing market for an array of cloud-related services. As such, it has attracted the attention of vendors from across the world and become a very competitive environment. In seizing those opportunities, vendors must contend with security concerns, connectivity shortfalls, high costs, and other negative developments. These make the Brazilian market a challenging but potentially rewarding one for firms with the resources and commitment to manage these issues.

Overall Rank

6

Brazil has strongly emerged as a major driver of regional IT investment in general and of expenditure on cloud services in particular.[1, 2] Research firm IDC estimates that 2013 cloud spending in Brazil grew almost 70 percent from the prior year to $257 million, split mainly between infrastructure-as-a-service (IaaS) and software-as-a-service (SaaS) offerings.[3, 4] IDC has forecasted 2015 spending of $798 million, with SaaS sales up 81.2 percent, IaaS up 71.3 percent, and platform-as-a-service (PaaS) up 58 percent, all on a compound annual basis from 2013. Consultancy Frost and Sullivan is also bullish, calling for overall Brazilian cloud revenue of $1.1 billion by 2017.[5] This represents a five-year compound annual growth rate of almost 40 percent. By 2017, the firm expects the SaaS market to lead at $584.3 million in spending, while IaaS and PaaS will be worth $489.9 million and $39 million, respectively.[6]

Nearly three out of four Brazilian IT decision-makers asked in a recent survey today use a SaaS application, often for enterprise resource planning or customer relationship management.[7] Smaller but still-substantial numbers reported adopting IaaS (55 percent, largely for data backup purposes) and PaaS (39 percent) and the uptake rates of both (but especially IaaS) are expected to pick up in the next few years. Some of the key motivators cited by respondents include the desire to achieve cost savings, enable innovation, and raise productivity.

The same survey found that no single type of cloud computing deployment is significantly more popular than others. One in four respondents said they use public cloud services, one in six private, one in six hybrid, and another one in four indicated no preference.[8] Smaller companies seem to favor public clouds and IaaS, while larger ones lean towards

hybrid solutions.[9, 10] However, security-related concerns are expected to drive much greater adoption of private and hybrid cloud setups over the next few years, with a corresponding decrease in public cloud usage.[11] Small and medium-sized enterprises (SMEs) may also come to command a larger share of cloud expenditure, with one industry watcher forecasting that they will drive nearly half of Brazil's total.[12] Cloud provider SAP already attributes 68 percent of its Brazilian revenues to SMEs (and points to the 440,000 SMEs not using cloud services as potential customers).[13]

Given the current situation and expectations for the future, it is clear that Brazil (along with Chile) is at the center of the movement towards cloud computing in Latin America – a region where annual projected growth in cloud spending exceeds 26 percent.[14, 15] Further, the ongoing economic slowdown is expected to spur enterprise IT decision-makers to consider cloud-based options, which offer the prospect of lower overall costs (as mentioned above, a critical motivating factor for cloud adoption in Brazil).[16]

Such opportunities have not gone unnoticed by cloud vendors both foreign and domestic. Major U.S. providers such as Amazon, IBM, Microsoft, Oracle, and Verizon maintain or have plans to introduce Brazil-based data centers to support their local cloud operations, while others like Dell, Google, Rackspace, and Salesforce at least market their services in the country.[17-25] Other foreign providers like German cloud heavyweight SAP, the UK's BT Global Services, and Japan's Fujitsu are also present.[26, 27, 28] Prominent domestic players include major firms Locaweb, Mandic, Totvs, and UOLDIVEO.[29, 30]

A variety of telecommunications operators, such as Embratel and Telefonica's Vivo, also offer cloud services.[31] While it may be harder for these more recent entrants to wrestle IT spending from cloud-centric players, they have managed to craft credible offerings, according to Frost and Sullivan, and likely have the financial resources to establish themselves in the sector.[32, 33]

Although prominent players such as the above do not always directly compete in the same segments or offer interchangeable services, they do dominate the market and contribute to a very competitive environment requiring a serious commitment of time and resources.

Various other factors further complicate the landscape. Chief among these, according to numerous industry watchers and market participants, may be concerns about the reliability and security of data stored in the cloud.[34-39] One major survey found that the possibility of a data breach and a more general lack of trust were barriers to cloud adoption among 62 percent and 52 percent, respectively, of the local IT decision-makers asked (especially among those in the financial industry).[40] These fears reflect some common global perceptions as well as the higher prevalence of cybercrime in Brazil.[41] As Capgemini, the consultancy behind the survey, points out, however, the situation may actually benefit U.S. cloud providers, who often bring to the table stronger security-related expertise and credentials. Other major factors cited by respondents included data sovereignty and cost.

A host of additional issues weigh on the overall development of the industry. The cost of energy, along with high equipment prices and taxes, make running a Brazilian data center relatively expensive.[42, 43, 44] The country's leading ICT trade group found that, at $61 million, setting up a local data center is about 42 percent more costly than in the United States.[45] Maintaining this operation requires approximately $100 million annually, more than twice the U.S. amount.[46] Given the competitive

value of offering lower latencies and addressing data sovereignty concerns through a domestic data center, many better-resourced firms are likely to simply absorb these high costs.

Brazil also suffers from significant connectivity challenges. The cost of bandwidth is much higher than in other countries with competitive cloud sectors, and there are clear shortfalls in the reliable provision of service and in infrastructure, especially when it comes to the critical last-mile of delivery.[47, 48] Such factors sew doubt as to the availability of data stored in the cloud, which requires a steady broadband connection to be fully useful.[49]

Draft versions of Brazil's Marco Civil da Internet, enacted in June 2014, included a requirement for the domestic storage of data obtained from Brazilian sources.[50] Although this provision was ultimately dropped, it is still quite conceivable that future policy efforts with data localization or other elements damaging to U.S. providers may emerge. Nevertheless, the reaction to the Marco Civil's localization proposal demonstrated that Brazilian stakeholders, who along with foreign groups pushed back against it, understand the drawbacks of such measures and that Brazil's political process allows for meaningful debate and constructive revisions to announced legislative initiatives. These factors could help blunt potential future efforts to enact data localization rules, which would likely impose costs or other operational difficulties for U.S.-based cloud vendors and domestic companies.

In January 2015, the government began public consultations on a new data protection bill that could contain similar restrictions on data transfers.[51] An early draft of the bill aligns closely with European approaches for the treatment and transfer of personal data, as has been the case with past drives in Brazil for privacy legislation.[52] This may complicate matters for many U.S. cloud vendors – especially those for whom a lack of local infrastructure necessitates the transfer of data to servers in the United States.[53] The draft likely will see some revision as Brazil's fluid political processes continue.

India

India's cloud services market has generated excitement among U.S. technology leaders and optimistic predictions for the future. While there are compelling reasons for this sanguine outlook, India also presents challenges in terms of security concerns, infrastructure, and other areas. Nevertheless, the market's current growth rates and significant potential are clear, earning India its 8th place ranking.

Overall Rank

8

In recent months, various U.S. cloud industry executives have visited India and declared its importance to their success. This comes as no surprise given that over 250 million Indians today use web-connected devices, which generally rely on cloud services for applications and other functionality.[1] As Internet access, e-commerce, mobile device and application usage, and business adoption continue to expand, the growth in cloud-related spending in India should outpace that in the rest of the world.[2] Research firm Gartner believes that by 2018 public cloud spending in India will reach nearly $2 billion, from $638 million in 2014.[3] From 2013 to 2014 alone, the firm's figures demonstrate a rise of about 34 percent. Other estimates are similarly upbeat, such as the $3.5 billion technology research group IDC predicts will be spent on cloud services in total in India by 2016 – growth of over 400 percent from the 2012 level.[4] Finally, Forrester expects the software-as-a-service (SaaS) market in particular to roughly double in value between 2014 and 2020, when it will be worth $1.2 billion.[5]

Besides deeper Internet penetration and smartphone adoption, a key driver of these optimistic forecasts is widespread interest among business customers, across several industries, in all types of cloud-related services.[6] One cloud adoption survey found that 96 percent of businesses queried either used cloud services or planned to begin doing so in 2015 (although other sources indicate that actual adoption rates are much lower).[7] It is also common for business customers to use multiple cloud vendors for their SaaS, infrastructure-as-a-service (IaaS), and platform-as-a-service (PaaS) applications.[8] Consequently, by 2018 Indian spending will reach $735 million for SaaS (from $249 million in 2014), $295 million for IaaS (from $77 million), and demonstrate strong gains in sub-sectors like PaaS and business-process-as-a-

service as well, according to Gartner.[9] Cloud vendors attempting to win a share of this spending have the opportunity to develop offerings that cater to the needs of a wide variety of industry segments, such as pharmaceuticals, healthcare, fast-moving consumer goods, and financial services.

U.S. cloud providers are clearly enthusiastic about the opportunities presented by India. Firms like IBM and Microsoft (which saw its commercial cloud revenue in the country double in 2013-14) have committed to having or already launched local data centers. Amazon founder Jeff Bezos has said that his firm is also evaluating the prospects for an Indian data center.[10] These efforts are a bid to improve technical performance, and perhaps more importantly, better appeal to customers for whom regulatory restrictions on data location have thus far limited cloud adoption.[11, 12, 13, 14]

Whether they have a physical presence or not, various cloud suppliers are today actively competing with each other for India's fast-rising cloud spending. Their strengths and areas of focus differ slightly, with Amazon Web Services' (AWS) adoption driven by business demand for public cloud services, Microsoft's growth propelled by SaaS offerings, and IBM focusing on private cloud.[15, 16]

Elements of cloud vendor competition seen in other markets, such as heavy advertising and aggressive price cuts by Amazon, exist in India.[17, 18] Google, Microsoft, and IBM are also aggressively competing to attract startups through "cloud credit" programs.[19] As of August 2014, Amazon had signed up over 8,000 Indian firms to AWS, while Microsoft has said it is adding 2,000 new cloud customers per month.[20] Other foreign companies with a presence in this fast-growing

and competitive market include HP, Red Hat, SAP, and Oracle.[21]

Despite optimistic predictions and clear interest from global players, however, a variety of challenges have held India's cloud potential back even as adoption continues growing. These have contributed to a situation in which, regardless of significant awareness, most large Indian enterprises are not thought to host more than 15 percent of their ICT processes in the cloud.[22] For example, while analysts have long predicted a boom in the country's cloud market, in 2013 issues such as a flagging currency (which artificially shrank budgets for foreign ICT services) and pre-general election reluctance among government departments to make new ICT-related investments likely slowed growth.[23]

A more ongoing problem is the country's Internet infrastructure (i.e., bandwidth constraints and fiber optic weaknesses) and the inconsistency of its power supply in some areas.[24] According to the United Nations, India meets the minimum Internet infrastructural standards necessary for only basic cloud services, with bottlenecks impacting download speeds, upload speeds, and network latency.[25] Further, the World Economic Forum ranked India a dismal 111th out of 148 countries for the availability of international Internet bandwidth, a measure of the amount of Internet traffic that can be exchanged between countries.[26] Various other rankings and indicators focused on Internet penetration, cloud readiness, and other factors confirm a sub-optimal state of affairs which, combined with ongoing shortfalls in the steady electricity supply needed for data center operations, is likely to continue putting some limits on cloud growth.

Fortunately, the government is acutely aware of these challenges, and its ambitious Digital India program aims to address some of the infrastructural weaknesses, though it remains to be seen if this will lead to significant improvements.[27] Moreover, the interest expressed by major cloud providers in establishing Indian data centers suggests that the electricity situation is either improving or they are becoming better at managing it. For example, some firms have implemented redundant power equipment setups and even rooftop solar panels to ensure an adequate supply.[28, 29] Placing data centers in areas with more consistent power capacity and better Internet infrastructure is another possible step.[30]

Another key issue relates to security concerns, especially around the use of foreign providers. While there is great interest in cloud-based solutions, misgivings remain about whether cloud services (and particularly public cloud) can ensure adequate protection of sensitive information.[31] Industry participants report that current adoption focuses on non-critical business workloads and SaaS applications unlikely to host particularly sensitive data, although "people are not as hesitant as they used to be" when it comes to cloud deployments overall, according to one industry expert.[32] In some sectors with traditionally large IT budgets (e.g., financial services, telecommunications) an especially strong emphasis on data security or regulations mandating domestic storage of customer data limit interest in cloud usage, especially with a foreign provider.[33]

India also presents a mixed policy environment for cloud services. Some elements of the environment remain undefined (e.g., India lacks a formal data breach notification rule), while others are clearly positive (e.g., there do not appear to be tariffs on software downloads) and some negative (e.g., government procurement, which though a major source of IT spending is reportedly a complex, multifarious process).[34, 35]

Citing the need to monitor domestic Internet traffic for national security reasons, concerns over foreign surveillance, and a desire to ensure that data is subject to local laws, the Indian government has for years supported the idea of foreign firms storing data within the country.[36]

One clear example of the push for data localization is found in the Department of Telecommunications' "National Telecom M2M Roadmap" (referring to machine-to-machine data transmission of the sort expected to increase substantially as Internet-connected devices become more common), posted in English in January 2015.[37] The guidelines call for "all M2M gateways and application servers" used in providing services to individuals in India to be physically located within the country, based on national security concerns. Although cloud vendors would not be the explicit focus of this provision, its inclusion points to the acceptance of data localization policies among some in the Indian government.

In the lead-up to the 2014 general elections, Bharatiya Janata Party (BJP) members also spoke about the possible need to enact measures like these to ensure

that Internet companies adhere to Indian laws and cultural expectations.[38] Further, Indian ISPs have cited privacy concerns in lobbying the government to require data localization.[39] With the BJP's electoral victory, it seems likely that additional rules may be introduced. These measures would be in line with policies on domestic data routing proposed by India in other forums and with the Modi government's recent moves to exert greater control over some online content. [40, 41, 42]

South Korea

South Korea, ranking 12th in our analysis, is one of the most stable markets for cloud computing due to existing infrastructure and government financing of ICT and cloud expansion. Moreover, foreign and U.S. providers have ample experience in the market, yet still are finding opportunities for growth, particularly in the private cloud sector. Operating in South Korea comes with certain regulatory challenges, particularly in dealings with public institutions. In addition, large U.S. and foreign providers already exist in the market and many Korean SMEs have established cloud enterprises. That said, the market is primed for ample growth and presents a strong and stable environment with high demand for cloud services.

Overall Rank

12

South Korea has an advanced existing telecommunications infrastructure that has supported substantial growth in the information and communications technology (ICT) sector for years. The country has been a regional leader in both ICT and cloud computing, and has the distinction of being one of five mature markets in the Asia-Pacific and Japan (APJ) region – along with Australia, Japan, New Zealand, and Singapore.

Even with the advanced ICT and cloud infrastructure, South Korea represents a top market for significant future growth. Research and Markets analysts predict the South Korean cloud computing market is on pace to grow roughly 22 percent through 2018.[1] One key driver for the projected growth is expected substantial government investment in private cloud computing for government agencies, a bidding process open to U.S. providers.[2]

The South Korean government has or is expected to enter into numerous public-private partnerships to expand cloud services regionally through data center development. Additionally, South Korea has existing universal broadband access, driving demand for investments utilizing the universal broadband to expand access to new technologies, such as cloud services. South Korea is the global leader in broadband penetration – at 97 percent – as well as a leader in average peak connection – 68.5 megabits per second according to Akamai Technologies in Q1 of 2014.[3, 4]

In its 2014 report on regional "cloud readiness," the Asia Cloud Computing Association indicated that South Korea has the 6th highest level of readiness among the 14 countries examined in the region. It ranks among the highest in broadband expansion, a key component of the cloud infrastructure. While South Korea tied

India for the largest fall in position compared to previous rankings (down four spots from second), this was due more to gains in other countries than to faults in South Korea's cloud readiness.[5]

Along with the other mature markets in the APJ region, South Korea offers strong growth prospects for cloud services. Cloud management and security services, for example, are projected to grow nearly 30 percent in 2015 to $264.5 million in the APJ as a whole.[6] Gartner, a leading global information technology research company, predicts that by 2018, total public cloud services spending in the APJ region will be $11.5 billion.[7] South Korea's commitment to investing in cloud services for government agencies sets the country as a leader in the APJ region for public cloud services spending.

Gartner offered an interesting sector outlook on the APJ cloud market, providing guidance for cloud sector investment through 2018.[8] The firm predicts that at 21.5 percent, software-as-a-service (SaaS) will make up the largest sector share of the overall market; platform-as-a-service (PaaS) will account for 3 percent; cloud management/security services 4 percent; infrastructure-as-a-service (IaaS) 9.8 percent; with the remaining 52.5 percent attributable to the cloud advertising market.[9]

While overall the market is strong, there are issues for U.S. companies looking to enter. The most important challenge relates to security concerns within the South Korea government and among the general population, which have been exacerbated by recent global breaches of information stored on clouds in numerous countries, including South Korea.[10] This psychological barrier to storing data in the cloud will be an ongoing issue for U.S. providers in South Korea. Relatedly,

concerns over the hacking of information on public clouds have driven the South Korean market towards adopting private clouds, which are considered more secure.

Another challenge is the potential for slower growth in the South Korean economy. While the market is still predicted to perform well in terms of growth and investment, particularly in the ICT sector, in December 2014 the finance ministry revised a previous 2015 economic growth estimate down from 4 percent to 3.8 percent. Higher U.S. interest rates and a weak Japanese yen were the largest factors in the downward revisions (a decreasing Japanese yen hurts the South Korean economy by making Japanese exports cheaper than equivalent Korean goods).[11, 12]

Further, American companies are not alone in recognizing the market opportunities in South Korea. In January 2015, Chinese company Alibaba announced plans for a joint investment with the South Korean city of Incheon to create a $912 million business area in the city. It is unclear if this investment is explicitly to expand cloud services. However, the announcement comes after a summer 2014 request by South Korean President Park Geun-hye for Alibaba to assist South Korean small- and medium-sized enterprises (SMEs) in entering the Chinese market.[13] Additionally, the SME market contains a substantial number of domestic cloud providers who benefit from government investments and incentives for local companies.

The implicit challenges of entering a somewhat saturated market should not overshadow the real growth potential in South Korea. While the country's slip in the "cloud readiness" ratings signaled a potential weakening in cloud infrastructure compared to its Asian competitors, the government has recently invested in an executive structure within the official bureaucracy to support ICT development.

Specifically, in 2013, the Ministry of Science, ICT, and Future Planning was created.[14] The new ministry saw a budget increase of more than $12 billion in 2014, and the aforementioned drop in regional competitiveness could spur even greater investment in the 2015 budget, a development that should be carefully tracked.[15] Therefore, South Korea seems well-positioned to sustain its position as a cloud and technology leader in the Asia-Pacific.

In March 2015, the Korean National Assembly passed the Act on Cloud Computing Promotion and Protection

of Users (Cloud Bill). Industry has expressed concerns about the legislation, including its requirement that cloud service providers inform users about where data is stored, as well as a prohibition on the transfer of data to third parties without user consent, a court order, or a warrant signed by a judge.

Before final passage of the legislation, some in U.S. industry came out against the Cloud Bill, citing mandatory requirements that are difficult to follow for foreign companies, providing an advantage for domestic ones.[16] However, potentially positive changes to the regulatory environment are part of the Cloud Bill as well. For example, government agencies are required to promote cloud implementation with a separate promise, per industry reports, that at least 15 percent of government services will be cloud-based by 2017.

South Korea's historic strength in ICT infrastructure and cloud development in the Asia-Pacific region is leading to strong participation by U.S. companies, including numerous plans for the future. In January 2015, for example, Microsoft released a predictive cloud service based on Azure learning machine released in the United States in 2014.[17] The service differs from existing data mining, analysis, and artificial intelligence as it is capable of making predictions based on data trends, which could advance the demand for cloud services in a number of fields.

Along with this release, Microsoft is planning to invest $450 million over five years on a South Korean data center, as part of a predicted $5.2 billion investment in the country through expanded infrastructure projects and jobs.[18] IBM has plans to complete a South Korean data center in the first half of 2015.[19] In addition, Cisco has committed to expanding its Intercloud business in support of developing South Korea's Internet of Things (IoT) market. Cisco invested $2 billion in Intercloud globally in 2014 and is expected to make significant further expansion a priority.

The Intercloud system involves a global interconnection of public, private, and hybrid clouds for processing, contributing to the growth of IoT industry. Lastly, Google is expected to build a community hub, called a Campus, in Seoul. This will enable entrepreneurs to learn and share ideas, while expanding the company's presence in the country.[20, 21] While impressive, these are only a few of the major

cloud investments U.S. companies are making in South Korea.

South Korea represents a historically strong market for cloud services, despite existing market competition and the presence of established providers. Demand, which will be supported by local and national infrastructure investments, is still projected to be strong for capable U.S. vendors, and South Korea should be a top market considering the growth potential for cloud services in 2015.

This Page Intentionally Left Blank

China

Although China is a fast-growing, important market for global cloud computing, the country presents serious challenges for U.S. cloud providers and ranks only 13th in the listing. Regulatory restrictions, some aspects of governmental decision making, and local competition make China a problematic market for even large, experienced U.S. providers. Operating in China therefore requires substantial resources, flexibility, and a long-term outlook.

Overall Rank

13

While in some keys ways China is at an earlier stage in cloud adoption than other large economies, it is clear that the market is expanding notably and poised for significant future growth. Estimates of the size and growth rate of the domestic cloud computing sector vary widely. The Ministry of Industry and Information Technology (MIIT) has reported that China's public cloud market was worth approximately 4.8 billion RMB ($771.2 million at current exchange rates) in 2013 and expects 36 percent growth for 2014.[1] Gartner projects the public cloud market to reach $20.7 billion by 2018, with an annual growth rate of 31.5 percent (while IDC notes sustained annual growth of over 40 percent in the Chinese public cloud market).[2, 3]

As for the broader market, the state-run China Software Industry Association previously predicted the overall cloud value chain would be worth at least $122 billion by 2015, although some more recent estimates have trended lower.[4, 5]

In addition to enterprise usage, a key driver will be the continued adoption of smartphones, the applications for which often rely on cloud services. Almost 500 million smartphones should be sold in China in 2015.[6] These will help an expected 680 million Chinese citizens access the Internet next year and propel total 2015 ICT spending of over $465 billion in the country, according to analyst estimates.[7]

As in other sectors, the main challenge for U.S. firms in seizing cloud-related opportunities in China is its regulatory environment. For example, foreign cloud providers are required to partner with local companies to serve customers in China, raising questions about how much control foreign providers will ultimately have over their joint ventures, given that their Chinese partners may fully manage daily operations.[8, 9, 10] Moreover, certain regulatory requirements impact the

hardware and software that may be used in offering cloud services, necessitate that extra care be taken to avoid hosting certain content, and create uncertainty about some industries' ability to contract with foreign cloud providers.[11, 12] To deal with these challenges, U.S. companies have found it necessary to completely isolate their China cloud systems from their global ones, creating likely technical inefficiencies and other operational complications.[13]

Further, government policies designed to promote locally-based cloud vendors are likely to continue, especially given the focus on cloud computing in the 2011-16 Five-Year Plan.[14, 15] Concerns also exist about the application of China's Anti-Monopoly Law.[16, 17]

Other key regulatory developments rose to prominence at the close of 2014 and in the first few months of 2015.

The first is a planned security rating system to be used in assessing the "trustworthiness" of cloud providers vying for public contracts.[18] Foreign firms are expected to be able to participate in the review process, though in doing so they may be required to turn over proprietary source code. That the head of a Chinese virtualization firm described the system as a "golden opportunity" to challenge foreign providers raises further concerns.[19]

Secondly, reports indicate that the central government may be aiming to by 2020 have removed foreign-made software and hardware from major segments of the economy, such as the military, banks, some government bureaus, and the country's massive state-owned enterprises.[20] This helps explain recent changes to the list of foreign technology software and hardware permitted for purchase by China's government agencies.

Over the past few years, the number of approved foreign vendors for some government procurement has fallen considerably, while so many Chinese-made products have been added that the overall list grew by over 66 percent from 2012 to 2014.[21] Policymakers have also already determined that a pilot program in which a domestically-sourced operating system and servers replaced foreign-supplied alternatives was successful.[22] As is the case in other instances, exceptions may be made for companies that hand over proprietary information for security review.

The same situation may exist in China's banking sector, where foreign ICT suppliers are currently well represented. Recent government guidelines for ICT in the banking sector called for 75 percent of banks' ICT systems to utilize "secure and controllable" technology by 2019 and required banks to provide source codes to government authorities and use indigenous Chinese IP, among other restrictive measures.[23] In April 2015, China decided to suspend implementation of the banking guidelines and to issue new guidelines in the future.[24] It remains to be seen whether future rules will contain similar requirements. Given the restrictive approach of the banking guidelines and the possibility that a similar approach could eventually be applied to other major sectors, there is still serious cause for concern. Further, a draft anti-terrorism law would demand the domestic storage of Chinese user data, creating an array of cost, administrative, and political challenges for U.S. cloud vendors.[25] Here too there are indications that the law may not ultimately be enacted as initially envisioned.[26]

Other country-specific factors complicate the provision of cloud services by U.S. firms to this growing market. For instance, although awareness of public cloud options is on the rise, the traditional focus in China has been on private cloud functionality – potentially limiting the attractiveness of some U.S. providers' offerings.[27]

Another challenge is a lack of trust in foreign technology and worries about data security.[28] According to one Shanghai-based e-commerce firm, "We won't do that [utilize foreign cloud services] now because we don't know if it is safe to do that for our data... It is so hard to handle and control the situation if something unfair happens to us [when] working with a foreign company."[29] It is unclear whether U.S. cloud providers, while more experienced and innovative in their service offerings than most local competitors,

will be able to overcome such concerns even after partnering with a local player.

Mainland China's Internet download speeds also present issues. The penetration of broadband access, which is critical to the meaningful use of cloud services, is only about 14 percent.[30, 31] Average download speeds are only 3.14 to 4 megabits per second. The average download speed in Hong Kong, by contrast, exceeds 44 megabits per second, while the developed world standard is 17.4 megabits per second.[32, 33]

Chinese Internet-filtering systems contribute to this slowness and latency tests have confirmed the importance of having in-country technical infrastructure, although concerns also exist about China's electricity infrastructure and ability to dependably supply power to large data center operations.[34, 35] Fortunately, the deployment of LTE networks and other infrastructural upgrades should help ameliorate the barriers to cloud computing created by slow or unreliable networks.[36]

Despite challenges like these, several large, well-resourced U.S. cloud providers have pushed into the sizeable Chinese market through joint partnerships with local companies. For example, Microsoft has partnered with 21Vianet, a Chinese data services firm, to roll out public cloud services.[37] Consequently, Azure launched with general availability in China in March 2014, while some 20,000 enterprise customers signed up to try Office 365 during a public preview period.[38]

While with Azure's shift to general availability Microsoft can claim to be "the first global company to make onshore public cloud services available to customers in China," it is one of many U.S. firms eager to break into the market.[39] Amazon's new Beijing region is now in limited public release and also focuses on public cloud offerings. The firm is reportedly working with ChinaNetCenter, SINNET, and various other partners.[40] It highlights customers such as Xiaomi and Qihoo 360. For its part, IBM is teaming with 21Vianet and Tencent.[41, 42] HP's local partner is Beijing UnionRead Information Technology Ltd. and a China-based executive projected that its Helion services should be available in 2015.[43] Oracle currently sells cloud services in China and is in talks to establish a local data center.[44]
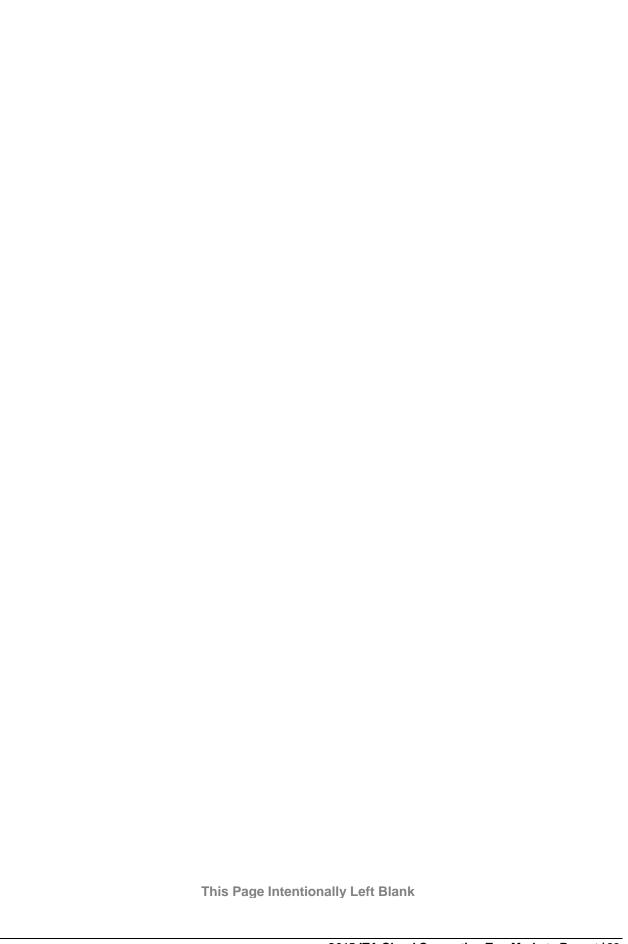
Whether players like Microsoft and Amazon will be able to overcome the traditional Chinese preference

for private clouds, the general distrust towards foreign providers, and a complex regulatory environment remains to be seen. At least on the last point, however, the requirement to partner with established Chinese firms may facilitate smoother relations with regulators than would otherwise prevail.

Those connections may also prove critical given the rise of domestic cloud service providers. E-commerce giant Alibaba's Aliyun service is already a notable competitor, servicing 1.4 million customers directly and indirectly.[45] China Mobile, China Unicom, China Telecom, Baidu, Tencent, and ZTE are among the other large, well-resourced, and technically-savvy Chinese

companies offering or preparing to offer some sort of cloud service.[46, 47, 48]

Although some point out that local players currently lack some of the larger U.S. firms' key advantages (e.g., scale, technical skill, innovative services), there can be no doubt that these gaps will close to varying degrees over the next several years. Overall, as of May 2013, the China Cloud Computing Technology and Industry Alliance listed 15 domestic cloud platform providers, 174 offering various cloud applications, and 64 selling hosting services.[49]

This Page Intentionally Left Blank

Appendix 1: Methodology

The rankings in this report were determined after review of export data from the U.S. Bureau of Economic Analysis (BEA), various reports and statistics on factors deemed significant to cloud computing adoption, original research, and in some cases input from U.S. Department of Commerce staff stationed in the relevant countries.

Consultation with a BEA staff member clarified that two of the three categories of export data likely to include cloud computing transactions were "Computer and Data Processing Services" and "Rights to General Use Computer Software."[1] To account for sales by foreign affiliates of U.S. companies, the "Computer Systems Design and Related Services" category of the "Services Supplied to Foreign Persons by U.S. MNEs Through Their MOFAs, by Industry of Affiliate and by Country of Affiliate" table was also considered. These data sets were aggregated and average annual growth rates across a variety of regions calculated and examined.

The BEA data is credible and thorough but does not cover every potential market for U.S. cloud computing exports. It includes only 33 countries (13 in Asia Pacific, 11 in Europe, six in Latin America and the Caribbean, two in the Middle East, and one in Africa). While many major markets are represented, this is nevertheless a limiting factor. Further, although all of the profiled markets had complete data sets available for the first two categories mentioned above, foreign affiliate data was not available for India and South Korea. This information was also incomplete in multiple years for Brazil, China, and Mexico, although in each case there were figures covering the three to four most recent years for which BEA presents data.

Another major input into the rankings was the existing body of reports relevant to cloud computing adoption in various countries. These covered a wide array of topics, such as broadband penetration rates and volumes of data flows, international Internet bandwidth, business and consumer adoption of ICT and its use for business-to-business transactions, the availability of the latest technologies and of digital content, cloud adoption by firms, and the regulatory and policy environments for cloud computing. Some specific resources consulted were:

- Information Economy Report 2013: The Cloud Economy and Developing Countries, from the United Nations Conference on Trade and Development
- Global Flows in a Digital Age: How Trade, Finance, People, and Data Connect the World Economy, from the McKinsey Global Institute
- The Global Cloud Index, from Cisco
- The State of the Internet Report, from Akamai
- The G20 E-Trade Readiness Index, from the Economist Intelligence Unit
- The Global Information Technology Report 2014: Rewards and Risks of Big Data, from the World Economic Forum
- The Internet Economy in the G-20, from the Boston Consulting Group
- Hosting and Cloud Study 2014: Hosting and Cloud Go Mainstream, from 451 Research
- The State of Cloud Application Adoption in Large Enterprises, from Tata Consultancy Services
- The 2013 BSA Global Cloud Computing Scorecard: A Clear Path to Progress, from BSA | The Software Alliance
- The Cloud Readiness Index 2014, from the Asia Cloud Computing Association
- The Global Mercantilist Index, from the Information Technology and Innovation Foundation

Information from the World Bank about the gross domestic product of each ranked country was also considered.

The two final inputs into the rankings were the original research conducted into the featured markets and comments submitted by in-country U.S. Department of Commerce specialists from several markets.

Findings from these sources were analyzed and compared, which led to the creation of the ranking. As cloud computing is a fast-changing sector often characterized by a lack of publicly-accessible market data and for which no single metric or even group of them can pinpoint future adoption with certainty, the ranking is a subjective one. However, it is based on extensive review of what data is available, numerous highly-credible reports, information from commercial specialists on the ground, and the subject matter expertise of the U.S. Department of Commerce's Office of Digital Services Industries. Therefore, while the rankings are unlikely to perfectly capture every facet of global markets, they should still be a useful reference tool for cloud computing professionals, industry watchers, and researchers alike.

Appendix 2: Citations

Executive Summary and Key Findings

1 http://www.skyhighnetworks.com/offers/wp-cloud-adoption-risk-report-q3-2014/
2 http://www.zdnet.com/article/amazon-and-microsoft-top-gartners-iaas-magic-quadrant/
3 http://www.bloomberg.com/news/articles/2014-04-24/cloud-spending-by-companies-outpaces-predictions-forrester-says
4 http://www.networkworld.com/article/2175333/cloud-computing/idc--cloud-will-be--107b-industry-by-2017.html
5 http://www.techrepublic.com/blog/10-things/gartners-top-10-technology-trends-for-2015-all-about-the-cloud/
6 http://www.cloudcomputing-news.net/news/2014/nov/14/forrester-2015-predictions-report-explains-how-cloud-will-be-motivator/
7 http://www.forbes.com/sites/louiscolumbus/2015/01/24/roundup-of-cloud-computing-forecasts-and-market-estimates-2015/
8 Ibid
9 http://www.forbes.com/sites/louiscolumbus/2014/12/20/idc-predicts-saas-enterprise-applications-will-be-a-50-8b-market-by-2018/
10 http://www.cisco.com/c/en/us/solutions/collateral/service-provider/global-cloud-index-gci/Cloud_Index_White_Paper.html#Trend3
11 http://www.idc.com/getdoc.jsp?containerId=prUS25219014
12 http://www.bvsconsulting.com/seven-common-challenges-faced-by-cloud-providers-when-entering-the-wholesale-telecoms-market/
13 http://www.computerworld.com/article/2860980/hybrid-cloud-adoption-set-for-a-big-boost-in-2015.html
14 http://www.idc.com/getdoc.jsp?containerId=prUS25219014
15 http://www.cisco.com/c/en/us/solutions/collateral/service-provider/global-cloud-index-gci/Cloud_Index_White_Paper.html#Trend3
16 http://thoughtsoncloud.com/2014/05/future-cloud-computing-5-predictions/
17 http://www.cisco.com/c/en/us/solutions/collateral/service-provider/global-cloud-index-gci/Cloud_Index_White_Paper.html#Trend3
18 https://www.oracle.com/webfolder/s/delivery_production/docs/FY15h1/doc3/trianglesurvey-cw-oracle2-v8.pdf
19 Ibid
20 http://www.idc.com/getdoc.jsp?containerId=prUS25219014
21 https://gigaom.com/2015/01/18/ge-tech-guru-gives-public-cloud-a-big-high-five/
22 http://www.idc.com/getdoc.jsp?containerId=prUS25219014
23 http://www.equinix.com/resources/analyst-reports/cloud-adoption-study/
24 http://www.mckinsey.com/features/sizing_the_internet_economy

Japan

1 http://cloudtimes.org/2015/01/23/gartner-apac-public-cloud-spending-to-reach-7-4-billion-in-2015/
2 http://www.asiacloudcomputing.org/research/cri2014
3 Ibid
4 http://www.marketwatch.com/story/cloud-computing-market-in-japan-2014-2018-2014-08-12
5 Ibid
6 http://www.asiacloudcomputing.org/research/cri2014
7 http://www.cisco.com/web/IN/about/network/cloud_apac.html
8 Ibid
9 http://cloudscorecard.bsa.org/2013/assets/PDFs/country_reports/Country_Report_Japan.pdf
10 http://www.forbes.com/sites/amitchowdhry/2014/08/12/google-invests-in-300-million-underwater-internet-cable-system-to-japan/
11 http://www.marketwatch.com/story/cloud-computing-market-in-japan-2014-2018-2014-08-12
12 http://investor.mdsol.com/releasedetail.cfm?releaseid=877219
13 http://www.ibtimes.com/alibaba-south-korean-city-incheon-mulling-912m-joint-investment-alibaba-town-1780238
14 Ibid
15 http://www.dailytech.com/Microsoft+Reports+Mixed+Q2+2015+Earnings+on+China+Russia+and+Japan+Woes/article37107.htm
16 Ibid

United Kingdom

1 https://www.gov.uk/government/publications/information-communications-technology-ict-in-the-uk-investment-opportunities/information-communications-technology-ict-in-the-uk-investment-opportunities
2   http://sp.parallels.com/news/pr/release/article/parallels-smb-cloud-insightsTM-for-the-united-kingdom-shows-cloud-services-market-reaches-pound19-bil/
3 http://cloudindustryforum.org/white-papers/581-cloud-the-normalisation-of-cloud-in-a-hybrid-it-market
4 Ibid
5 http://www.equinix.hk/resources/analyst-reports/cloud-adoption-study-uk/
6 http://www.computerweekly.com/news/2240208482/Cloud-not-meeting-CIO-expectations-and-SaaS-still-dominates-take-up
7 http://docs.media.bitpipe.com/io_10x/io_102267/item_835374/2014%20Priorities%20Europe.pdf
8 http://sp.parallels.com/fileadmin/parallels/documents/smb-reports/2014/Parallels_SMB_report_UK_20140930_web.pdf
9 http://www.computerweekly.com/news/2240208482/Cloud-not-meeting-CIO-expectations-and-SaaS-still-dominates-take-up
10 http://cloudindustryforum.org/white-papers/581-cloud-the-normalisation-of-cloud-in-a-hybrid-it-market
11 https://gigaom.com/2014/10/31/salesforce-opens-first-european-data-center-in-uk/
12 http://www.v3.co.uk/v3-uk/analysis/2329980/rackspace-explains-why-uk-beat-the-nordics-for-latest-data-centre-site
13 http://www.eurocloud.org.uk/members
14 http://cloudindustryforum.org/membership/members

15 http://www.cloudpro.co.uk/risks/3342/cloud-security-concerns-causing-uk-adoption-lag
16 http://www.computerweekly.com/news/2240208482/Cloud-not-meeting-CIO-expectations-and-SaaS-still-dominates-take-up
17   http://www.kpmg.com/uk/en/issuesandinsights/articlespublications/newsreleases/pages/uk-businesses-are-reluctant-to-stick-their-head-in-the-clouds-says-kpmg.aspx
18 http://cloudindustryforum.org/white-papers/581-cloud-the-normalisation-of-cloud-in-a-hybrid-it-market
19 http://www.computerweekly.com/news/2240177830/SaaS-remains-most-popular-form-of-cloud-computing-for-UK-IT
20 http://jitm.ubalt.edu/XXIV-1/article1.pdf
21 http://www.computerweekly.com/feature/Cloud-computing-UK-companies-adopt-eagerly-but-often-insecurely
22 Ibid
23 http://www.computerweekly.com/news/2240206091/UK-risks-falling-behind-in-cloud-adoption-report-reveals
24 Ibid
25 http://www.idc.com/getdoc.jsp?containerId=prUK25380115
26 https://www.xero.com/blog/2014/05/cloud-adoption-among-uk-accounting-firms/
27 http://www.cloudpro.co.uk/cloud-essentials/hybrid-cloud/4696/hybrid-cloud-adoption-gaining-ground-among-it-pros
28 http://cloudindustryforum.org/white-papers/581-cloud-the-normalisation-of-cloud-in-a-hybrid-it-market

Germany

1   http://www.prnewswire.com/news-releases/cloud-computing-market-in-germany-2014-2018-key-vendors-are-amazon-web-services-google-fujitsu-ibm-microsoft-rackspace-and-salesforcecom-282438641.html
2   http://www.cbi.eu/sites/default/files/study/product-factsheet-cloud-computing-uk-norway-sweden-finland-denmark-netherlands-germany-outsourcing-bpo-ito-2014.pdf
3 Note: All conversions from EU to USD represent exchange rates as of 3/8/2015
4 Ibid
5 http://analystpov.com/cloud-computing/cloud-computing-adoption-in-germany-in-2014-24837
6   http://www.cbi.eu/sites/default/files/study/product-factsheet-cloud-computing-uk-norway-sweden-finland-denmark-netherlands-germany-outsourcing-bpo-ito-2014.pdf
7 Ibid
8 Ibid
9 http://www.datacenterdynamics.com/focus/archive/2014/09/microsoft-considers-secure-german-only-cloud

Brazil

1 http://www.thewhir.com/web-hosting-news/brazil-investments-reached-61-6-billion-2013-idc
2 http://transfer-lbc.com/en/1140/brazil-cloud-computing-sales-to-grow-743-until-2016.html
3 http://www.bnamericas.com/news/technology/brazil-cloud-computing-sales-to-grow-743-over-next-three-years-idc
4 http://www.telecompaper.com/news/brazilian-companies-to-spend-usd-257-million-on-cloud--931501
5 http://www.slideshare.net/FrostandSullivan/frost-sullivan-analysis-of-the-brazilian-cloud-computing-market
6 Ibid
7 http://www.br.capgemini.com/resource-file-access/resource/pdf/business_cloud_in_brazil_20140827_v15.pdf
8 Ibid
9 Ibid
10 http://www.thewhir.com/web-hosting-news/brazil-cloud-services-market-worth-1-11b-2017-report
11 http://www.br.capgemini.com/resource-file-access/resource/pdf/business_cloud_in_brazil_20140827_v15.pdf
12 http://ccskguide.org/new-era-of-cloud-computing-in-latin-america/
13 Ibid
14 http://www.bnamericas.com/news/technology/brazil-chile-top-cloud-computing-adoption-in-latin-america-says-idc-analyst
15   http://www.technavio.com/pressrelease/technavio-publishes-new-research-report-on-the-cloud-computing-market-in-latin-america
16 http://www.thewhir.com/web-hosting-news/brazil-cloud-services-market-worth-1-11b-2017-report
17 http://aws.amazon.com/choosing-a-cloud-platform/
18 https://cloud.google.com/compute/docs/zones#available
19 https://www.business-cloud.com/articles/news/ibm-looks-south-latest-expansion-0
20 http://www.datacenterknowledge.com/archives/2014/06/05/microsoft-azure-clouds-brazil-south-region-goes-live/
21 http://www.rackspace.com/about/datacenters
22 http://www.bnamericas.com/news/technology/salesforce-to-open-second-latin-american-office-in-brazil
23 http://www.dell.com/br/empresa/p/cloud-client-computing
24 http://www.verizonenterprise.com/infrastructure/data-centers/latin-america/
25 http://www.bnamericas.com/news/technology/oracle-postpones-launch-of-first-latam-datacenter
26 http://www.zdnet.com/article/sap-invests-in-brazil-cloud-facility/
27 http://www.thewhir.com/web-hosting-news/bt-global-services-extends-cloud-infrastructure-services-to-brazil-columbia
28 http://www.fujitsu.com/global/about/resources/news/press-releases/2012/1004-02.html
29 http://www.zdnet.com/article/totvs-acquires-saas-firm/
30 http://jelastic.com/jelastic-and-locaweb-announced-a-new-partnership/
31   http://www.designative.info/2014/01/22/information-technology-in-brazil-cloud-computing-is-expected-to-move-us-798-million-in-2015/
32 http://cloudconf.com.br/arquivos/CloudConf2012_Rafael_Moreira.pdf
33 http://webservices.thesba.com/2013/07/10/cloud-computing-on-the-rise-amongst-businesses-in-brazil/
34 http://www.alog.com.br/en/noticias/mercado-de-computacao-em-nuvem-no-brasil/

35 http://ccskguide.org/new-era-of-cloud-computing-in-latin-america/
36 http://webservices.thesba.com/2013/07/10/cloud-computing-on-the-rise-amongst-businesses-in-brazil/
37 http://www.frost.com/prod/servlet/press-release.pag?docid=280724199
38 http://www.zdnet.com/article/brazilian-cloud-computing-market-to-reach-1-1bn-by-2017/
39 http://www.slideshare.net/FrostandSullivan/frost-sullivan-analysis-of-the-brazilian-cloud-computing-market
40 http://www.br.capgemini.com/resource-file-access/resource/pdf/business_cloud_in_brazil_20140827_v15.pdf
41 http://www.mcafee.com/us/resources/reports/rp-economic-impact-cybercrime2.pdf
42 http://www.eubrazilcloudconnect.eu/sites/default/files/TechPolis_CloudInBrazil_Report.pdf
43 http://thenextweb.com/la/2011/12/16/why-amazon-web-services-launched-in-south-america-and-why-it-matters/
44 http://ccskguide.org/new-era-of-cloud-computing-in-latin-america/
45 http://techpolis.com/its-taxing-cloud-computing-in-brazil/
46 Ibid
47 http://www.eubrazilcloudconnect.eu/sites/default/files/WhitePaper_Future_EUBrazil.pdf
48 http://techpolis.com/its-taxing-cloud-computing-in-brazil/
49 http://www.thewhir.com/web-hosting-news/brazil-cloud-services-market-worth-1-11b-2017-report
50   http://www.hldataprotection.com/2014/05/articles/international-eu-privacy/marco-civil-da-internet-brazils-new-internet-law-could-broadly-impact-online-companies-privacy-and-data-handling-practices/
51 http://www.bnamericas.com/news/telecommunications/brazil-begins-debating-marco-civil-regulations-privacy-bill
52 http://www.bakermckenzie.com/ARITCBakerThoughtsJan12/
53 http://www.reuters.com/article/2014/11/06/us-spying-un-idUSKBN0IQ28320141106

India

1 http://www.ibtimes.com/microsoft-invest-nearly-23m-three-cloud-data-centers-india-1723066
2   http://articles.economictimes.indiatimes.com/2014-10-27/news/55482991_1_public-cloud-services-market-cloud-providers-cloud-computing
3 http://www.gartner.com/newsroom/id/2869417
4 http://www.tata-bss.com/in/future-of-cloud-services-in-india-and-trends/
5 http://searchdatacenter.techtarget.in/news/2240222268/High-awareness-but-low-adoption-of-Public-Cloud-in-India
6   http://www.informationweek.in/informationweek/news-analysis/281917/indian-public-cloud-services-market-total-usd-434-million-2013-gartner
7 http://www.gartner.com/newsroom/id/2869417
8http://www.indiainfoline.com/article/news-top-story/cloud-is-top-investment-priority-among-indian-enterprises-114090500085_1.html
9 http://www.gartner.com/newsroom/id/2869417
10http://timesofindia.indiatimes.com/tech/tech-news/Amazon-considering-opening-data-centre-in-India-CEO-Jeff-Bezos/articleshow/44072493.cms
11 http://www.businessweek.com/news/2014-10-20/microsoft-s-nadella-touts-cloud-strategy-adds-partners
12 http://articles.economictimes.indiatimes.com/2014-10-27/news/55482991_1_public-cloud-services-market-cloud-providers-cloud-computing
13 http://www.techsharx.com/3302-microsoft-sets-warchest-for-us2-trillion-indian-cloud-computing-market.html
14   http://articles.economictimes.indiatimes.com/2014-11-13/news/56060722_1_data-centres-public-cloud-services-market-cloud-offerings
15http://cio.economictimes.indiatimes.com/news/cloud-computing/ibm-looking-beyond-cios-to-sell-cloud-computing-services/42336287
16 http://www.indiacioreview.com/news/ibm-aws-cloud-battle-steps-india
17 http://articles.economictimes.indiatimes.com/2014-08-21/news/53072779_1_public-cloud-cloud-market-amazon-cloud
18 http://www.indiacioreview.com/news/ibm-aws-cloud-battle-steps-india
19http://asdisruptiveasitgets.com/2014/09/18/google-microsoft-ibm-trying-to-lure-startups-with-goodies-press-media-economictimes/
20 http://articles.economictimes.indiatimes.com/2014-11-07/news/55871717_1_cloud-services-azure-machine-learning-big-data
21http://www.indiainfoline.com/article/news-top-story/cloud-is-top-investment-priority-among-indian-enterprises-114090500085_1.html
22 http://searchdatacenter.techtarget.in/news/2240222268/High-awareness-but-low-adoption-of-Public-Cloud-in-India
23 http://www.hostway.com/blog/india-and-the-cloud-cautious-optimism-for-significant-growth/
24 http://searchdatacenter.techtarget.in/news/2240226115/Indias-Cloud-adoption-rises-but-basic-challenges-remain-entrenched
25 http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=710
26 http://www3.weforum.org/docs/WEF_GlobalInformationTechnology_Report_2014.pdf
27   http://www.forbes.com/sites/saritharai/2014/09/18/india-wants-to-build-massive-digital-infrastructure-to-cover-800-million-rural-citizens-by-2019/
28 http://articles.economictimes.indiatimes.com/2014-10-27/news/55482991_1_public-cloud-services-market-cloud-providers-cloud-computing
29 http://cloudtimes.org/2013/01/06/cloud-computing-around-the-world-india/
30 http://www.businessmonitor.com/news-and-views/microsoft-overstates-indias-cloud-computing-market-potential
31 http://www.cnbc.com/id/101626286#.
32 http://searchdatacenter.techtarget.in/news/2240222268/High-awareness-but-low-adoption-of-Public-Cloud-in-India
33 Ibid
34 http://cloudscorecard.bsa.org/2013/assets/PDFs/country_reports/Country_Report_India.pdf
35 http://searchdatacenter.techtarget.in/news/2240226115/Indias-Cloud-adoption-rises-but-basic-challenges-remain-entrenched
36 http://www.bloomberg.com/news/2010-09-01/india-asks-rim-google-skype-to-set-up-local-servers-update1-.html
37 http://www.dot.gov.in/sites/default/files/Draft%20National%20Telecom%20M2M%20Roadmap.pdf

38 http://www.lawfareblog.com/wp-content/uploads/2014/07/Lawfare-Research-Paper-Series-Vol2No3.pdf
39 http://www.medianama.com/2013/06/223-foreign-internet-companies-may-be-asked-to-setup-local-servers-in-india/
40 http://www.cfr.org/internet-policy/itu-unbundling-internet-governance/p33656
41 http://timesofindia.indiatimes.com/tech/social/India-leads-in-asking-Facebook-to-censor-content/articleshow/33624878.cms
42 http://www.zdnet.com/article/india-lifts-block-on-vimeo-pastebin-internet-archive-others-still-banned/

South Korea

1 http://www.researchandmarkets.com/research/4htwp4/cloud_computing
2 http://www.thewhir.com/web-hosting-news/south-korean-government-boost-private-cloud-spending-report
3 http://www.forbes.com/sites/alanmcglade/2014/02/06/why-south-korea-will-be-the-next-global-hub-for-tech-startups/
4 http://www.akamai.com/dl/akamai/akamai-soti-q114.pdf
5 http://www.asiacloudcomputing.org/research/cri2014
6 http://www.networksasia.net/article/public-cloud-services-mature-apac-markets-hit-7-4-billion-2015-gartner.1421740044
7 http://www.gartner.com/newsroom/id/2963417
8 http://www.networksasia.net/article/public-cloud-services-mature-apac-markets-hit-7-4-billion-2015-gartner.1421740044
9 Ibid
10 http://www.itpro.co.uk/security/22968/south-korean-data-breach-results-in-220m-records-stolen
11 http://www.bloomberg.com/news/2014-12-22/south-korea-cuts-2015-growth-forecast-warns-on-external-risks.html
12 http://blogs.wsj.com/korearealtime/2014/11/07/yen-fall-more-damaging-for-korea-this-time-economist-says/
13 http://www.ibtimes.com/alibaba-south-korean-city-incheon-mulling-912m-joint-investment-alibaba-town-1780238
14 http://www.forbes.com/sites/alanmcglade/2014/02/06/why-south-korea-will-be-the-next-global-hub-for-tech-startups/
15 Ibid
16 http://blogs.blouinnews.com/blouinbeattechnology/2015/01/05/the-uncertain-future-for-south-koreas-cloud/
17 http://www.datacenterknowledge.com/archives/2014/09/22/report-microsoft-data-center-coming-to-south-korea/
18 Ibid
19 http://socmedtech.com/ibm-will-establish-cloud-data-center-south-korea-2015/
20   http://www.sciencebusiness.net/news/76874/%E2%80%9CWe-want-Google-to-be-an-engine-of-entrepreneurship-in-Europe%E2%80%9D
21 http://www.zdnet.com/article/google-to-launch-campus-for-asian-startups-in-seoul/

China

1   http://globenewswire.com/news-release/2014/10/31/678652/10105649/en/21Vianet-Receives-Industry-Awards-for-Cloud-Computing-Services.html
2 http://www.pcworld.com/article/2842032/ibm-joins-tencent-to-target-chinas-growing-enterprise-cloud-market.html
3 http://www.eweek.com/cloud/microsoft-azure-expands-into-china.html
4 http://www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf
5 http://www.chinadaily.com.cn/business/tech/2014-05-23/content_17537219.htm
6 http://bits.blogs.nytimes.com/2014/12/02/in-2015-technology-shifts-accelerate-and-china-rules-idc-predicts/
7 Ibid
8 http://www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf
9 Ibid
10 http://www.chinaeconomicreview.com/china-cloud-computing-microsoft-azure-amazon-aws-ibm-aliyun
11 http://www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf
12 http://www.chinaeconomicreview.com/china-cloud-computing-microsoft-azure-amazon-aws-ibm-aliyun
13 Ibid
14 http://www2.itif.org/2014-china-ict.pdf
15 http://www.businessweek.com/articles/2013-09-10/will-cloud-computing-in-china-be-a-boon-or-peril-for-business
16 http://www.reuters.com/article/2014/09/11/china-antitrust-idUSL3N0RC2MY20140911
17 http://www.wsj.com/articles/china-probes-microsoft-over-antimonopoly-issues-1406628234
18 http://www.zdnet.com/article/china-explores-trust-rating-index-for-cloud-vendors/
19 http://www.zdnet.com/article/china-explores-trust-rating-index-for-cloud-vendors/
20 http://www.bloomberg.com/news/2014-12-17/china-said-to-plan-sweeping-shift-from-foreign-technology-to-own.html
21 http://www.reuters.com/article/2015/02/26/us-china-tech-exclusive-idUSKBN0LT1B020150226
22 http://www.bloomberg.com/news/articles/2014-12-17/china-said-to-plan-sweeping-shift-from-foreign-technology-to-own
23 Ibid
24 http://www.wsj.com/articles/china-halts-implementation-of-banking-tech-guidelines-1429181094?mod=WSJ_TechWSJD_moreTopStories
25 http://arstechnica.com/tech-policy/2015/01/it-vendors-cry-foul-at-new-chinese-security-rules-requiring-built-in-backdoors/
26 http://www.reuters.com/article/2015/03/13/us-china-security-usa-iduskbn0m91zt20150313
27 http://www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf
28 Ibid
29 http://www.chinaeconomicreview.com/china-cloud-computing-microsoft-azure-amazon-aws-ibm-aliyun
30 http://www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf
31 http://www2.itif.org/2014-china-ict.pdf
32 http://www.businessweek.com/articles/2013-09-10/will-cloud-computing-in-china-be-a-boon-or-peril-for-business
33 http://www.globalpost.com/dispatch/news/regions/asia-pacific/china/131120/cloud-computing-china
34 https://gigaom.com/2014/08/21/hewlett-packard-takes-its-helion-openstack-cloud-to-china/

35 http://fac.comtech.depaul.edu/yhwang1/Article_MIS350/article_12.pdf
36 http://www.zdnet.com/article/chinas-kingsoft-unveils-full-cloud-services-suite/
37 http://www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf
38 http://www.zdnet.com/article/office-365-cloud-service-officially-launched-in-china/
39 http://blogs.microsoft.com/blog/2014/03/26/microsoft-becomes-the-first-global-public-cloud-provider-in-china-with-the-general-availability-of-microsoft-azure-in-the-region/
40 http://news.xinhuanet.com/english/business/2014-01/02/c_133013661.htm
41 http://www.networkworld.com/article/2172878/cloud-computing/ibm-follows-amazon-s-move-into-china-s-cloud-computing-market.html
42 http://www.pcworld.com/article/2842032/ibm-joins-tencent-to-target-chinas-growing-enterprise-cloud-market.html
43 https://gigaom.com/2014/08/21/hewlett-packard-takes-its-helion-openstack-cloud-to-china/
44 http://www.datacenterknowledge.com/archives/2014/09/30/discussions-of-oracle-cloud-data-center-in-china-in-progress/
45 http://www.bloomberg.com/news/2014-10-17/alibaba-adds-philips-provincial-governments-as-cloud-cus.html
46 http://techcrunch.com/2014/05/11/aliyun-hongkong/
47 http://fac.comtech.depaul.edu/yhwang1/Article_MIS350/article_12.pdf
48 http://bits.blogs.nytimes.com/2014/08/04/alibaba-has-a-computing-cloud-and-its-growing-too/?_r=0
49 http://www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf

Industry & Analysis' (I&A) staff of industry, trade and economic analysts devise and implement international trade, investment, and export promotion strategies that strengthen the global competitiveness of U.S. industries. These initiatives unlock export, and investment opportunities for U.S. businesses by combining in-depth quantitative and qualitative analysis with ITA's industry relationships.

For more information, visit
www.trade.gov/industry

I&A is part of the International Trade Administration, Whose mission is to create prosperity by strengthening the competitiveness of U.S. industry, promoting trade and investment, and ensuring fair trade and compliance with trade laws and agreements.

INTERNATIONAL
T R A D E
ADMINISTRATION